

COMBUSTION AIR SIZING WORKSHEET

- 1) Is this heating appliance to be fueled by gas, liquid, or solid fuel? _____
 - 2) Is the room where the heating appliance is located within this building "Unusually Tight Construction" [see COMM 65.0201(1) for definition]? _____ (YES or NO)
 - 3) Is the appliance location in a confined space? _____ (YES or NO)
 - 4) Combustion air for this appliance is to be drawn from which of the following?

_____ Outdoor air only.
 _____ Indoor air only.
 _____ Combination of indoor and outdoor air.
 - 5) Rated input maximum capacity of this appliance is: _____ Btu/hour
 - 6) Aggregate input of **all** appliances in the room or space is: _____ Btu/hour
 - 7) Volume of the room in which this appliance is placed is: _____ cubic feet
 Length = _____ Width = _____ Height = _____
 - 8) Do any exhaust systems present affect the combustion air supply? _____ (YES or NO)
 - 9) Are ducts used to provide combustion air to appliances? _____ (YES or NO)
 If **YES**, are ducts horizontal or vertical? _____
 - 10) List the distance down from the ceiling to top of the highest opening: _____ List the distance up from the floor to the bottom of the lowest opening: _____
 - 11) The minimum free area of combustion air opening required by my design for this appliance is: (check applicable one)

_____ 1 square inch per 1000 Btu/hour	_____ 1 square inch per 2000 Btu/hour
_____ 1 square inch per 2400 Btu/hour	_____ 1 square inch per 3000 Btu/hour
_____ 1 square inch per 4000 Btu/hour	_____ 1 square inch per 5000 Btu/hour
 - 12) Do louvers or grills affect the free area of ducts or openings used to supply combustion air to the appliances? _____ (YES or NO)
 - 13) Appliances, except by limited exceptions, are **not permitted** to be **located in or to obtain combustion air from** the following rooms or spaces: sleeping rooms, toilet rooms, bathrooms, storage closets, and surgical rooms. Does the proposed appliance location meet this IMC 303.3 & IFGC 303.3 prohibition? _____ (YES or NO)
 If **NO**, are any exceptions of IMC or IFGC Section 303.3 met? _____ (YES or NO)
- Submit all calculations of sizing of combustion air ducts or grills/louvered openings to be used.

INSTRUCTIONS

The intent of this worksheet is to help make clear to all parties affected (owner, designer, plan examiner, and building or fire inspector) that adequate combustion air is provided. A separate worksheet may be used for each appliance or in limited cases (similar appliances), just one for all of the appliances. Note that for fireplaces the combustion air calculations may be required to be submitted with the building plan.

The first question is asked: “Is this heating appliance to be fueled by gas, liquid, or solid fuel?” This is asked to determine which Code is to be used to determine combustion air requirements for the appliance. For gas use IFGC Section 304 and for liquid or solid fuel use IMC Chapter 7 to size combustion air rate.

The second question is asked: “Is the room where the heating appliance is located within this building “Unusually Tight Construction”?” The simple **yes** or **no** response is required. The Wisconsin amended definition for Unusually Tight Construction is found in COMM 65.0201(1) and deals with % openings.

- A **yes** response to question 2 will require that the combustion air be supplied from only outside air (or vented attic spaces that freely communicate with the outdoors). This will require that remaining questions 5, 6, 8, 9, 10, 11, 12 & 13 be answered (questions 3, 4, & 7 do not apply).
- A **no** response to question 2 will permit either interior or exterior combustion air supply.

The third question is asked: “Is the appliance location in a confined space?” The response of **yes** or **no** is required. The IFGC Section 202 definition of “confined space” and the answers to questions 6 and 7 will be used to help determine the yes or no response.

- A **yes** response to question 3 will permit a choice in question 4 of combustion air source.
- A **no** response to question 3 means that adequate inside air is already provided, thus it only will require that remaining questions 5, 6, 7, 8, 12 & 13 be answered.

The fourth question asks from where the appliance combustion air is to be taken. This is a design decision, not a guess. The final design affects each of the remaining questions on this sheet. Department representatives could easily make a wrong assumption about the adequacy of the combustion air design when this crucial piece of information is missing. If a combination of inside and outside air is used, calculations must clearly show that a sum of the percentages of each will total to more than 100%.

The answers to questions 5 & 6 will be the same when only one appliance is in a space. When more than one appliance is located in a space, then each appliance should be investigated and the whole group must be accounted for in the design. A more complicated combustion air design occurs when there are multiple appliances of more than one fuel type located in one space. The need to answer questions 5 and 6 is more critical in any design that contains multiple appliances.

Question 7 is the volume of the room in which the appliance is placed. The IFGC does allow rooms that are open to each other to combine the volume of the two spaces, provided code requirements are met. An example when two spaces may combine their volume is when an appliance is listed for installation in an alcove (or closet) that is properly vented to the conditioned space. This condition is made clear to the plan examiner by the three dimensions listed as the second part of this question. However, any prohibitions stated in question 13 must be carefully observed as well.

Question 8 is asked to verify that there are no clothes dryers, kitchen exhaust hoods, or other such exhaust systems that will negatively affect the combustion air supply. Open combustion in negative pressure environments can lead to carbon monoxide gas produced or explosion hazards. The answer to question 8 should be **no**. Some of the areas in question 11 require the space to be a negative pressure in relation to adjacent space; thus the prohibition on their use as a location of open flame appliances is logical.

INSTRUCTIONS (continued)

Question 9 is a two part conditional question. First you are asked if ducts are used to provide combustion air to the appliance, which is a simple **yes** or **no** response.

If the response is **no**, then move on to question 10.

But if the response is **yes**, then the second part of the question must be answered. The second part responses may be any of these three: **vertical**, or **horizontal**, or **both vertical and horizontal**. The duct direction information is needed to determine the correct formula used to calculate the duct size per IFGC 304.11.1 or IMC Chapter 7 requirement. Horizontal ducts require larger size than vertical ducts serving the same size appliances.

Question 10 asks the location of the top of the highest opening relative to the ceiling. Then it asks the distance from the bottom of the lowest opening relative to the floor. Usually there are two openings required for combustion air design per IMC Chapter 7 and IFGC Sections 304.10 & 304.11.1 & 304.12.1. But IFGC Section 304.11.2 does allow a method for a single opening to serve gas appliances; thus measurements would be top and bottom of the same opening listed in these two lines on this worksheet.

Question 11 asks for the combustion air sizing used. The designer must indicate the minimum free area of design combustion air required for appliance. Choices of 1 square inch per 1000, 2000, 2400, 3000, 4000, or 5000 Btu/hour are listed in IMC Chapter 7 and IFGC Sections 304.10 & 304.11 & 304.12. Factors used to determine the correct rate for sizing of the opening include: the source of the air (indoors or outdoors or a combination); the use of ducts (or not); the location of the opening (vertical or horizontal); the number of openings (one or two or more); and if forced combustion air supply system is used (or not).

Question 12 asks if louvers are used on the combustion air supply openings. The answer is almost always going to be **yes**. The yes response is a reminder that combustion air sizes required by codes are a “free area” of air transfer. IFGC Section 304.14 permits the actual louver free air size to be used to size the opening, if actual size is known. If actual size is not known, then the presence of metal louvers or grills will result in a code allowance of 60% to 75% of the opening to be actual “free area”. Wood louvers will be limited by code to be 20% to 25% of the opening to be “free area”. Duct size will be affected by the type of grill or louver used at the inlet & outlet of the combustion air duct system.

Question 13 begins with the requirement found in IFGC Section 303.3 that restricts the location of gas appliances, except as permitted by limited exceptions. It then asks a simple **yes** or **no** question about the proposed appliance location. The **yes** answer, indicating that the appliances are not located in any of these prohibited locations will be the usual response. But on occasion the appliance location may cause a no response. When that happens, there are 5 exceptions of IFGC Section 303.3 or there are 3 exceptions in IMC 303.3 to permit the appliance in that location to not be a code violation. Answer **yes** if your location satisfies one of those exceptions and you may even want to note on the plans or Worksheet which of the exceptions is being met, to make it clear to the code officials. The **no** response to this second part of the question is an indication of code violation, and will require the design to be revised to either relocate the appliance or else to meet one of the listed exceptions.

Submit all calculations of sizing of combustion air ducts to be used, especially when using combinations. Also submit all calculations of sizing of combustion air opening grills or louvers to be used. Plans must indicate the type of louvers to be used and the free area of each. Submittal of the calculations and louver information will eliminate the need for any code official to try to replicate work that the designer has already done and will clearly indicate to the code official which method of combustion air design is to be used for each appliance. The code official will then know for certain the method used, rather than possibly second-guessing a designer’s proposed combustion air design method and citing it as a violation.

EXAMPLES

Assume a one story steel frame building which contains a 200 seat restaurant with 2 (two) large rooftop units for space conditioning, and a kitchen with a gas range, a gas oven, 2 (two) gas deep fryers, and a large gas water heater. There is also attached a 200' x 200' warehouse served by 3 (three) oil unit heaters and a 200' x 75' grocery store served by rooftop units. Also this building has a 120' x 100' office, a 40' x 40' daycare, and a 60' x 50' children's museum with a single gas-fired furnace in each space. All water heaters in each space are electric, except in kitchen.

What is the minimum amount of combustion air required for each space?

Plans show an equipment schedule, part of the schedule shows the following information:

UNIT	LOCATION	SIZE	COMMENTS
Rooftop Make-up Air Unit #1	Above Restaurant Dining	100 MBH input	On roof
Rooftop Make-up Air Unit #2	Above Restaurant Kitchen	120 MBH input	On roof
Wolf Range Co. 4-burner w/griddle	In Restaurant Kitchen	150 MBH input	
Hobart Food Equipment rack oven	In Restaurant Kitchen	100 MBH input	
Modular S R L gas-fired deep fryer	In Restaurant Kitchen	60 MBH input	
Modular S R L gas-fired deep fryer	In Restaurant Kitchen	60 MBH input	
A O Smith gas-fired water heater	In Restaurant Kitchen	80 MBH input	Suspended unit
Modine Mfg Co oil-fired unit heater	In Warehouse	200 MBH input	Suspended unit
Modine Mfg Co oil-fired unit heater	In Warehouse	150 MBH input	Suspended unit
Modine Mfg Co oil-fired unit heater	In Warehouse	200 MBH input	Suspended unit
Rooftop Air Handling Unit #3	Above Grocery Store	150 MBH input	On roof
Rooftop Air Handling Unit #4	Above Deli & Meat Dept	100 MBH input	On roof
Lennox gas-fired furnace	In Alcove off Main Office	180 MBH input	
Masonry Fireplace wood-burning	In Reception area of Office	180 MBH input	
Carrier gas-fired furnace w/AC	In Daycare Mechanical room	100 MBH input	In rated room
Rheem gas-fired furnace w/AC	In Museum storage closet	120 MBH input	Direct vent unit

What is the minimum amount of combustion air required for each space? The answer is in many parts.

First, the rooftop units for restaurant and grocery store are mounted outdoors, thus combustion air is not a concern for those four appliances shown in the table above.

Secondly, the direct vent furnace in the storage closet in a Museum space will have combustion air supply vented directly to the appliance per the manufacturer's requirements, thus it meets exception 1. of IFGC section 303.3 and is not a combustion air sizing concern for plan review.

Thirdly, some areas have multiple appliances in the same space. As these are gathering combustion air from the same space, they may be addressed by a single worksheet for all of the appliances in that space. Thus all the Kitchen gas-fired appliances may use a single worksheet and also all the Warehouse oil-fired appliances may use a single worksheet.

Fourthly a wood-burning fireplace is located in a room separate from the room with the furnace.

Finally, each of the remaining furnaces must have a separate worksheet only for that appliance.

The four worksheets and calculations would be as shown on the following pages.

Kitchen COMBUSTION AIR SIZING WORKSHEET

- 1) Is this heating appliance to be fueled by gas, liquid, or solid fuel? gas
- 2) Is the room where the heating appliance is located within this building "Unusually Tight Construction" [see COMM 65.0201(1) for definition]? YES (YES or NO)
- 3) Is the appliance location in a confined space? YES (YES or NO)
- 4) Combustion air for this appliance is to be drawn from which of the following?
X Outdoor air only.
 _____ Indoor air only.
 _____ Combination of indoor and outdoor air.
- 5) Rated input maximum capacity of this appliance is: 150,000 Btu/hour
- 6) Aggregate input of **all** appliances in the room or space is: 450,000 Btu/hour
- 7) Volume of the room in which this appliance is placed is: 7200 cubic feet
 Length = 40 feet Width = 18 feet Height = 10 feet
- 8) Do any exhaust systems present affect the combustion air supply? YES (YES or NO)
- 9) Are ducts used to provide combustion air to appliances? YES (YES or NO) CAUTION using damper controls
 If **YES**, are ducts horizontal or vertical? vertical *direct to outside*
- 10) List the distance down from the ceiling to top of the highest opening: 12 inches
 List the distance up from the floor to the bottom of the lowest opening: 12 inches
- 11) The minimum free area of combustion air opening required by my design for this appliance is: (check applicable one)

_____ 1 square inch per 1000 Btu/hour	_____ 1 square inch per 2000 Btu/hour
_____ 1 square inch per 2400 Btu/hour	_____ 1 square inch per 3000 Btu/hour
<u>X</u> 1 square inch per 4000 Btu/hour	_____ 1 square inch per 5000 Btu/hour
- 12) Do louvers or grills affect the free area of ducts or openings used to supply combustion air to the appliances? YES (YES or NO)
- 13) Appliances, except by limited exceptions, are **not permitted** to be **located in or to obtain combustion air from** the following rooms or spaces: sleeping rooms, toilet rooms, bathrooms, storage closets, and surgical rooms. Does the proposed appliance location meet this IMC 303.3 & IFGC 303.3 prohibition? YES (YES or NO)

If **NO**, are any exceptions of IMC or IFGC Section 303.3 met? _____ (YES or NO)

Calculations of sizing of combustion air ducts and grills/louvered openings to be used.

Kitchen has gas appliance(s) which use two vertical combustion air ducts from the kitchen to the building exterior, therefore IFGC 304.11.1 applies. Heating equipment has 450,000 Btu/hr output capacity; thus $450,000 \text{ Btu/hr} / [(4000 \text{ Btu/hr})/\text{inch}] = 112.5$ square inches of duct opening required in each combustion air duct. Each exterior opening has an 8" x 22" metal louver with 64% free area; $8" \times 22" \times 0.64 = 112.6 \text{ in}^2$.

Rate is per IFGC 304.11.1 and louver uses 60 percent free area (conservative) of IFGC Section 304.14.

Warehouse COMBUSTION AIR SIZING WORKSHEET

- 1) Is this heating appliance to be fueled by gas, liquid, or solid fuel? liquid
- 2) Is the room where the heating appliance is located within this building "Unusually Tight Construction" [see COMM 65.0201(1) for definition]? NO (YES or NO) With answer of NO to both #2 & #3, response below question 8 is not needed
- 3) Is the appliance location in a confined space? NO (YES or NO)
- 4) Combustion air for this appliance is to be drawn from which of the following?
 _____ Outdoor air only.
 X Indoor air only.
 _____ Combination of indoor and outdoor air.
- 5) Rated input maximum capacity of this appliance is: 200,000 Btu/hour
- 6) Aggregate input of **all** appliances in the room or space is: 550,000 Btu/hour
- 7) Volume of the room in which this appliance is placed is: 720,000 cubic feet
 Length = 200 feet Width = 200 feet Height = 18 feet
- 8) Do any exhaust systems present affect the combustion air supply? NO (YES or NO)
- 9) Are ducts used to provide combustion air to appliances? _____ (YES or NO)
 If **YES**, are ducts horizontal or vertical? _____
- 10) List the distance down from the ceiling to top of the highest opening: _____
 List the distance up from the floor to the bottom of the lowest opening: _____
- 11) The minimum free area of combustion air opening required by my design for this appliance is: (check applicable one)
 _____ 1 square inch per 1000 Btu/hour _____ 1 square inch per 2000 Btu/hour
 _____ 1 square inch per 2400 Btu/hour _____ 1 square inch per 3000 Btu/hour
 _____ 1 square inch per 4000 Btu/hour _____ 1 square inch per 5000 Btu/hour
- 12) Do louvers or grills affect the free area of ducts or openings used to supply combustion air to the appliances? _____ (YES or NO)
- 13) Appliances, except by limited exceptions, are **not permitted** to be **located in or to obtain combustion air from** the following rooms or spaces: sleeping rooms, toilet rooms, bathrooms, storage closets, and surgical rooms. Does the proposed appliance location meet this IMC 303.3 & IFGC 303.3 prohibition? _____ (YES or NO)
 If **NO**, are any exceptions of IMC or IFGC Section 303.3 met? _____ (YES or NO)

Calculations of sizing of combustion air openings to be used.

Since the warehouse has (5) 14'x 14' overhead doors, (2) 12'x 10' overhead doors, and (3) 3'x 7' exit doors; building is not Unusually Tight Construction (over 3% of floor area as outdoor openings).

$$200' \times 200' \times 0.03 = 1200 \text{ ft}^2 \text{ opening required} \leq \text{provided } 1241 \text{ ft}^2 = 5(196) + 2(120) + 3(21) \text{ ft}^2$$

3%

Office COMBUSTION AIR SIZING WORKSHEET

- 1) Is this heating appliance to be fueled by gas, liquid, or solid fuel? gas
- 2) Is the room where the heating appliance is located within this building "Unusually Tight Construction" [see COMM 65.0201(1) for definition]? NO (YES or NO)
- 3) Is the appliance location in a confined space? YES (YES or NO)
- 4) Combustion air for this appliance is to be drawn from which of the following?
 - Outdoor air only.
 - Indoor air only.
 - X Combination of indoor and outdoor air.
- 5) Rated input maximum capacity of this appliance is: 180,000 Btu/hour
- 6) Aggregate input of **all** appliances in the room or space is: 180,000 Btu/hour
- 7) Volume of the room in which this appliance is placed is: 8,880 cubic feet
 Length = 6' & 36' Width = 5' & 30' Height = 8 feet
- 8) Do any exhaust systems present affect the combustion air supply? NO (YES or NO)
- 9) Are ducts used to provide combustion air to appliances? YES (YES or NO)
 If **YES**, are ducts horizontal or vertical? both horizontal and vertical
- 10) List the distance down from the ceiling to top of the highest opening: 8 inches
 List the distance up from the floor to the bottom of the lowest opening: 10 inches
- 11) The minimum free area of combustion air opening required by my design for this appliance is: (check applicable one)

<u> X </u> 1 square inch per 1000 Btu/hour	<u> X </u> 1 square inch per 2000 Btu/hour
<u> </u> 1 square inch per 2400 Btu/hour	<u> </u> 1 square inch per 3000 Btu/hour
<u> </u> 1 square inch per 4000 Btu/hour	<u> </u> 1 square inch per 5000 Btu/hour
- 12) Do louvers or grills affect the free area of ducts or openings used to supply combustion air to the appliances? YES (YES or NO)
- 13) Appliances, except by limited exceptions, are **not permitted** to be **located in or to obtain combustion air from** the following rooms or spaces: sleeping rooms, toilet rooms, bathrooms, storage closets, and surgical rooms. Does the proposed appliance location meet this IMC 303.3 & IFGC 303.3 prohibition? YES (YES or NO)
 If **NO**, are any exceptions of IMC or IFGC Section 303.3 met? (YES or NO)

Submit all calculations of sizing of combustion air ducts or grills/louvered openings to be used.

Office has a gas appliance which uses two (2) combustion air ducts that used for obtaining air from inside the building and two (2) combustion air ducts that are both horizontal and vertical in design for access to the exterior of the building. The most stringent of the two IFGC 304.11.1 requirements apply, as well as IFGC 304.10. Combustion air from inside and outside the building will be used for combustion air purposes. Review Comm 65.0304(3) requirement.

From inside the building:

Total interior volume = $[(6' \times 5') + (36' \times 30')] \times 8' = 8,880$ cubic feet

Total interior volume required per Comm 65.0304(3) if the space were to be declared an "Unconfined space" = $(180,000 \text{ Btu/hr}) \times 250 \text{ cubic feet} / (1000 \text{ Btu/hr}) = 45,000$ cubic feet

From outside the building:

(Use the most stringent criteria of 1 square inch/2000 Btu/hr for horizontal combustion air ducts, as it is more stringent than 1 square inch/4000 Btu/hr for vertical combustion air ducts.)

Thus $180,000 \text{ Btu/hr} / [(2000 \text{ Btu/hr})/\text{square inch}] = \text{minimum } 90$ square inches of duct opening required in each exterior air duct.

Apply IFGC 304.12:

*Ratio must be $>$ or $= 1.00 = [\text{Total Interior Volume} / (\text{Interior Volume Required if Unconfined})] + [\text{Exterior Duct Area} / \text{Exterior Duct Area Required if only exterior combustion air were used}]$
 $= (\text{Int. } 8,880 \text{ cubic feet actual} / 45,000 \text{ cubic feet required}) + (\text{Ext. area (per duct)} / 90 \text{ square inch})$*

$0.197 + (z/90) = 1.00 \rightarrow z/90 = 0.803 \rightarrow z = 72.3$ square inches (minimum duct opening size required for each exterior duct)

The minimum required free area within the building between adjoining spaces used for interior combustion, located at both high & low locations would require 1 square inch/1,000 Btu/hr per IFGC 304.10 in both the high and low openings;

$180,000 \text{ Btu/hr} \times 1 \text{ square inch} / (1,000 \text{ Btu/hr}) = 180$ square inches of free area each

The minimum required free area used for exterior combustion, located for high & low locations: Each louvered opening going to the exterior of building for combustion air purposes would require a minimum of 72.3 sq. inches of free area each.

Assuming metal louvers with 60% free area each are used, the minimum interior and exterior louver sizes would be:

For the inside: $180 \text{ square inches} / 0.60 = 300$ square inches (Roughly a 15" x 20" unit)

For the exterior: $72.3 \text{ square inches} / 0.60 = 120.5$ square inches (Roughly a 11" x 11" unit)

Office fireplace COMBUSTION AIR SIZING WORKSHEET

- 1) Is this heating appliance to be fueled by gas, liquid, or solid fuel? solid
- 2) Is the room where the heating appliance is located within this building "Unusually Tight Construction" [see COMM 65.0201(1) for definition]? YES (YES or NO)
- 3) Is the appliance location in a confined space? YES (YES or NO)
- 4) Combustion air for this appliance is to be drawn from which of the following?
X Outdoor air only.
 _____ Indoor air only.
 _____ Combination of indoor and outdoor air.
- 5) Rated input maximum capacity of this appliance is: 180,000 Btu/hour
- 6) Aggregate input of **all** appliances in the room or space is: 180,000 Btu/hour
- 7) Volume of the room in which this appliance is placed is: 1728 cubic feet
 Length = 18 feet Width = 12 feet Height = 8 feet
- 8) Do any exhaust systems present affect the combustion air supply? NO (YES or NO)
- 9) Are ducts used to provide combustion air to appliances? YES (YES or NO)
 If **YES**, are ducts horizontal or vertical? horizontal
- 10) List the distance down from the ceiling to top of the highest opening: 10 inches List the distance up from the floor to the bottom of the lowest opening: 12 inches
- 11) The minimum free area of combustion air opening required by my design for this appliance is: (check applicable one)
 _____ 1 square inch per 1000 Btu/hour X 1 square inch per 2000 Btu/hour
 _____ 1 square inch per 2400 Btu/hour _____ 1 square inch per 3000 Btu/hour
 _____ 1 square inch per 4000 Btu/hour _____ 1 square inch per 5000 Btu/hour
- 12) Do louvers or grills affect the free area of ducts or openings used to supply combustion air to the appliances? YES (YES or NO)
- 13) Appliances, except by limited exceptions, are **not permitted** to be **located in or to obtain combustion air from** the following rooms or spaces: sleeping rooms, toilet rooms, bathrooms, storage closets, and surgical rooms. Does the proposed appliance location meet this IMC 303.3 & IFGC 303.3 prohibition? YES (YES or NO)
 If **NO**, are any exceptions of IMC or IFGC Section 303.3 met? _____ (YES or NO)

This is a wood appliance with horizontal ductwork, therefore IMC 703.1.3 applies; Fireplace has 180,000 Btu/hr output capacity. $180,000 \text{ Btu/hr} / [(2000 \text{ Btu/hr})/\text{square inch}] = \text{minimum } 90 \text{ square inches of horizontal duct opening required. Exterior opening has a } 10'' \times 12'' \text{ metal louver with } 75\% \text{ free area; } 10'' \times 12'' \times 0.75 = 90 \text{ square inches.}$

Daycare COMBUSTION AIR SIZING WORKSHEET

- 1) Is this heating appliance to be fueled by gas, liquid, or solid fuel? gas
- 2) Is the room where the heating appliance is located within this building "Unusually Tight Construction" [see COMM 65.0201(1) for definition]? NO (YES or NO)
- 3) Is the appliance location in a confined space? YES (YES or NO)
- 4) Combustion air for this appliance is to be drawn from which of the following?
X Outdoor air only.
 _____ Indoor air only.
 _____ Combination of indoor and outdoor air.
- 5) Rated input maximum capacity of this appliance is: 100,000 Btu/hour
- 6) Aggregate input of **all** appliances in the room or space is: 100,000 Btu/hour
- 7) Volume of the room in which this appliance is placed is: 1920 cubic feet
 Length = 12 feet Width = 16 feet Height = 10 feet
- 8) Do any exhaust systems present affect the combustion air supply? NO (YES or NO)
- 9) Are ducts used to provide combustion air to appliances? YES (YES or NO)
 If **YES**, are ducts horizontal or vertical? both
- 10) List the distance down from the ceiling to top of the highest opening: 2 inches
 List the distance up from the floor to the bottom of the lowest opening: 112 inches
- 11) The minimum free area of combustion air opening required by my design for this appliance is: (check applicable one)

_____ 1 square inch per 1000 Btu/hour	_____ 1 square inch per 2000 Btu/hour
_____ 1 square inch per 2400 Btu/hour	<u>X</u> 1 square inch per 3000 Btu/hour
_____ 1 square inch per 4000 Btu/hour	_____ 1 square inch per 5000 Btu/hour
- 12) Do louvers or grills affect the free area of ducts or openings used to supply combustion air to the appliances? YES (YES or NO)
- 13) Appliances, except by limited exceptions, are **not permitted** to be **located in or to obtain combustion air from** the following rooms or spaces: sleeping rooms, toilet rooms, bathrooms, storage closets, and surgical rooms. Does the proposed appliance location meet this IMC 303.3 & IFGC 303.3 prohibition? YES (YES or NO)
 If **NO**, are any exceptions of IMC or IFGC Section 303.3 met? _____ (YES or NO)

Calculations of sizing of combustion air ducts or grills/louvered openings to be used.
 Daycare has a gas appliance that has a single combustion air duct furnished directly from the building exterior, therefore IFGC 304.11.2 applies. Furnace has 100,000 Btu/hr output capacity; 100,000 Btu/hr / [(3000 Btu/hr)/square inch = minimum 34 square inches of duct opening required. Exterior opening has a 6" x 9" metal louver with 63% free area; 6" x 9" x (0.63) = 34 in² (free area of IFGC Section 304.14).
Rate is per IFGC 304.11.2 and louver uses (an acceptable) 63% free area of IFGC Section 304.14.